

LANGUAGE COMPILERS: SOME PRACTICAL OBSERVATIONS - Part 3: C-80 3.1

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This series of three articles provides an introductory look at three different language compilers for the CP/M operating system. The first article looked at BASIC/Z, the BASIC compiler supported by the BASIC/Z CORNER. The second article used Borland's TURBO Pascal. This article solves the same programming problem using the C/80 compiler from The Software Toolworks.

The program chosen for this discussion changes my Epson MX-100 printer from normal printing mode to condensed and back. The program uses many of the most useful aspects of any programming language, and the completed programs should be compared to see some of the differences among implementations.

The C Language

I must admit to being somewhat swamped by C, the general-purpose language used to write UNIX and its software. As I have mentioned previously, I am not a computer programmer, rather I prepare computer programs as necessary to solve problems that I encounter as a computer user. The 'simple' program that I used as my first programming problem in Pascal and took me less than a day to finish in that language took me better than a week in C. I haven't tried writing the routines in assembly language, but that would now seem to be a better test of the relative speed of programming.

C is currently available in a large number of variations for various micro-computer systems, in particular PC-DOS and MS-DOS, and appears to be one of the languages of choice for professional programmers today. Prices range from well under \$100 for a compiler and minimal function (sub-routine) library to several thousand dollars. The C/80 compiler and floating-point math routines cost me, for example, approximately \$100 (Canadian). I have a professional programmer friend who is currently purchasing a system for his MS-DOS machine, complete with math routines, graphic functions, etc.; it will cost him over \$3000 plus the cost of an 8087 math chip.

C is a relatively low-level language, but one that is transportable across systems since it isn't tied to any one computer chip. It is a small language (small C, described in Dr. Dobb's Journal, can be implemented on a CP/M system by anyone who wants to type in the code), but one that can be used equally well for writing operating systems or applications programs.

Variables and data types must be declared before use and can be character, integer or floating point numbers or derived from these three types. Structured program control is possible with loops that test at the top (while, for) or at the bottom (do), and decision making using either an if statement or a construction that is similar to the Pascal Case illustrated in the previous article. C allows for some very compact code, with several steps combined together on the same line or within the same statement. I suspect that many

individuals learn to use a new programming language in the same way that I do, by looking at programs prepared by other people. I have found that this technique has been almost impossible for learning C, as many C programmers make their code so dense as to be totally incomprehensible to a novice.

Software Toolworks C/80 3.1

C/80 appears to be a reasonably standard implementation of almost all of the standard C features. Floating point math functions are optionally available, and most of the standard I/O routines are included in the supplied library. C/80 takes source code typed with a standard editor (including WordStar and similar word-processors using the non-document mode) and produces assembly language code. This code can then be assembled using the supplied assembler or one of several others commonly available. I suspect that with a little work, it would even be possible to modify the function libraries to work with the Micropolis assembler, and produce programs that would work under MDOS. Library functions are combined at assembly time and in-line assembly language code can be used in the source program.

C/80 is available for the CP/M and HDOS operating systems. The CP/M version allows CP/M system calls, manipulates standard CP/M files, and allows program chaining. It seems to be a well implemented and inexpensive version of the C language. For all that I am finding C programming difficult, I am able to use the C/80 package with minimal problems, and would not hesitate to recommend it for someone wanting to learn the C language. My only caveat would be that C under CP/M is somewhat different from C under UNIX, particularly in how the systems handle files and I/O re-direction.

The Program

The C program below is certainly the longest of the three examples in this comparison. As mentioned above, it also took the longest to write, most of the time being required to develop a routine that would allow me to get a single character from the keyboard and another to send a single character to the printer.

The #define statements at the beginning of the program are equivalent to the EQU opcode in assembly language source programs. The numbers are the octal values for the indicated Epson functions. The #include statement provides the I/O routines for the printf (PRINT) statement. Note that upper and lower case letters are significant in C.

All C programs have a main() function. This is the where program execution starts and the global program variables are defined. In this case, the main activity of the program is controlled by the do statement which executes at least once and ends with the controlling "while (i != 1);". The exclamation/equal combination (!=) means not equal. Program segments can be seen visually by indentation and absolutely by the enclosing 'wiggily' brackets ({}).

The "\n" combination in the printf statements outputs a newline character (similarly \t would be a tab character, etc.). The next few lines accept a

character from the keyboard, throw away any extraneous characters, and leave the first character as the variable "response". This is necessary as getchar() is a very simple routine for getting a character and would normally leave the <RETURN> character as the variable value (the last value entered).

The "switch" lines provide a method for handling several cases. The "break" statement is required to keep control from passing into the next case, and exit(0) provides a normal exit to the operating system. The Epson output is provided by opening the printer channel (LST: in CP/M parlance) and outputting the single character required. Note the comments in the code which explain why the printer channel is not closed.

C/80 produced a 5K file that will execute independently (a .COM file). This is significantly shorter than the single program size of either of the other two compilers, and would have been even smaller if I hadn't needed the printf routine.

```
/* printer.c - change the Epson MX-100 print mode */
/* A.C.L. ZELMER, Feb 85 */
/* for c/80 Software Toolworks compiler */

#define NORM 022      /* Epson code for turning off condensed mode */
#define COND 017     /* Shift In: Turns on condensed mode */
#define EOF -1
#include "printf.c"   /* File containing print formatting functions */

main()               /* PRINTER.C */
{
    int chan, i, dump, response; /* dump is merely a throw-away variable */
                                /* chan is the open file number (LST:) */
    i = 0;
    do {
        printf("PRINTER\n");
        printf("\n");
        printf("This program shifts the MX-100 printer.  ");
        printf("The printer must be ON;\n");
        printf("\n");
        printf("    for normal type          enter N\n");
        printf("    for condensed type          enter C\n");
        printf("    to eXit (quit)              enter X\n");
        printf("and press the <ENTER> or <RETURN> key.  :");

        response=getchar();      /* gets first character entered */
        while ((dump=getchar()) != EOF && dump != '\n');
                                /* clears the buffer to continue */

        switch (response)
        {
            case '\n' :
            case '\r' :
                i = 1;
        }
    } while (i);
}
```

```

        chan = fopen("LST:","w");
        putc(NORM,chan); /* open the LST: file, send the mode char. */
                          /* the file is not closed as doing so would */
                          /* send a ^z, causing an unwanted formfeed */
        break;
    case 'c' :
    case 'C' :
        i = 1;
        chan = fopen("LST:","w");
        putc(COND,chan);
        break;
    case 'x' :
    case 'X' :
        exit(0);
    default :
        printf("Please enter one of the specified responses.\n");
        printf("Press the <ENTER> or <RETURN> key to continue.\n");
        while ((dump=getchar()) != EOF && dump != '\n');
        break;
    }
} while (i != 1);
} /* main end */

```

Software Toolworks' documentation for C/80 is minimal with a note that it conforms almost completely with the book, The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie (Englewood Cliffs, NJ: Prentice-Hall, 1978). They also include a list of other references that will be useful for learning the C language. I have used only the 'Tutorial' chapter in Kernighan and Ritchie's book and sample programs in The Unix Programming Environment by Brian W. Kernighan and Rob Pike (same publisher, 1984). The first book is essential for a complete definition of the language, but these two books are not very useful for a novice learning the language.

I have had problems starting to use C, but it has provided one of the most challenging projects that I have had in the last several years. Considering the emphasis that is now being placed on UNIX and UNIX-like operating systems, I suspect that most of us will have to have at least some familiarity with C if we are going to keep up with developments in computer use. I don't look forward to the thoughts of converting my Micropolis system to a UNIX-like operating system, but my programmer friend assures me that it would be possible, and might even be necessary to be able to use new peripherals, etc. In addition, I have the challenge of keeping ahead of my students, some of whom want to learn to use C.

WARNING: Compilers are addictive!

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MICROPOLIS/VECTOR GRAPHIC USERS GROUP NEWSLETTER #59 - JUNE 1985

FROM THE BLOOMINGTON USERS' GROUP

I've received some meeting reports from the "Vector Graphic User's Group/Midwest", a group headed by Roger P. Groth. The Midwest group is more of an "in person", local meeting group, than is the MUG. They've not been in existence very long, but they've come up with some good information. If you live in their area, or if you just want to speak to Roger, you can reach him at 8429 Little Road, Bloomington, MN 55437-1301. Roger can also be reached by phone at 612/831-7877 on MWF mornings.

The following is information reproduced from their April 11 Meeting report.

Roger spoke with Ron Tharpe, Director of Marketing for Vector, and received assurances that if all recovery efforts failed (see "Vector Joins with Dual", pg 5 of the April newsletter), Vector would find a way to provide for the long-term viability of the 30,000 systems that have been sold. Included in that assistance would be the placing of the source code to Vector proprietary software in a trust.

The Midwest group notes that CONECT Version 2.1, Release 3 (the most recent release), still has problems implementing certain automatic features for both the Hayes Smartmodem 1200 and the Multi-Tech 212AH.

The Vector QUEST program is a search for third-party software which is compatible with Vector systems. If interested, contact Pat Lee, software product manager at Vector, at 805/499-5831.

Thaya Howard, software support technician at Vector, told Roger that the current releases of the CP/M operating system for Vector are as follows:

System B	(Std CP/M, 48K)	Version 2.20, Release 6
System B	(Std CP/M, 56K)	Version 2.20, Release 8
1600, 2600	(Std CP/M)	Version 2.22, Release 7
2800	(Std CP/M)	Version 2.22, Release 8
3005, 3105	(Std CP/M)	Version 2.22, Release 8
5005	(Std CP/M)	Version 2.24, Release 8
5005, 5032	(Ext CP/M)	Version 2.57, Release 9
5010E	(Ext CP/M)	Version 1.3, Release 3
V4 (all)	(Ext CP/M)	Version 1.5, Release 6
V4 (all)	(CP/M-86)	Version 1.5, Release 6

My thanks to Roger for supplying us with this information.

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VECTOR GRAPHIC NEWS

by Lou Woody, Sunrise Data Systems
10000 West 75th Street Suite 200, Shawnee Mission KS 66204

Well, Vector is still in the process of merging with Dual Systems. Some of the changes that have already occurred are that a representative from Dual is running the day-to-day operations. The two top Vector people made their exodus within a week after the press release was issued, indicating that the merger was in process.

We Vector dealers haven't been informed yet of the changes that will be happening due to the merger. No announcements will be made, I expect, until all the paperwork is complete and the merger is "official". One highly probable occurrence is that we dealers will also be given the opportunity to sell the systems that Dual is currently manufacturing. As of yet, however, we haven't heard a peep.

Another item of interest is that on July 1st, Vector is officially beginning a discontinuance of the Vector 4 series. This, I believe, is a highly significant move as the Vector 4 is the last series with hard sector floppy disk technology. After the Vector 4 is gone, you will not be able to interchange diskettes between the old machines and new machines. If this capability is important to you, don't hesitate making arrangements to get a Vector 4. Although no definite date has been set for the complete discontinuance, on July 1st we will experience a \$500 increase in price as the first step in the phaseout.

Until we meet again, keep on punchin' them keys.

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PROGRAMMING THE INTEL 8251

by S. Michael Raney
Rt. 4 Box 115, Greenfield IN 46140

After reading the letters in the February issue about programming the Intel 8251 IC, I fired up the old S100 machine and dug out these routines. The assembly language one, called initial.asm, contains drivers for a four-port serial board with 8253's used as baud generators and four 8251's used in the asynchronous mode. The BASIC/Z program is called config.bzs and is used to change the default values in the assembly language program. It would be simple to change the BASIC/Z program to initialize the 8251 directly. By eliminating the stuff not related to the 8251 this program would be greatly simplified.

Since I wrote these programs back in the late 50's I've forgotten some about the 8251 but I'll pass along what I remember.

The 8251 has a software reset to allow you to reprogram a previously programmed chip. 40H is the reset code. However you can't send this code to a chip

that has just been reset, either with hardware or software, because the chip will try to interpret it as a MODE word.

Now for a little information about asynchronous communications in general. When using parity you must program the 8251 for a 7-bit word length. Conversely, when not using parity you must program it for an 8-bit word length. Any other method would be considered nonstandard. Also, as for stop-bits, I've never seen a device that needs more than one stop-bit to function. It's possible that at very high baud rates and a very slow processor, some device might need more than one, but the 8251 never does. By the way, stop-bit programming only affects the transmitter in 8251.

Here's an example of how you could reprogram the chip with BASIC/Z:

```
MODEWORD&=16R4F
!
!**** 1 STOP BIT, NO PARITY, /64 ****
!
COMMANDWORD&=16R37
!
!**** TRANSMIT ENABLE, RECEIVE ENABLE, ERROR RESET, RTS ON, DTR ON ****
!
RESET&=16R40
!
@START
!
OUT(STATUS.PORT)=RESET&
OUT(STATUS.PORT)=MODEWORD&
OUT(STATUS.PORT)=COMMANDWORD&
!
!**** CLEAN ANY GARBAGE OUT OF THE DATA PORT BEFORE USING ****
DUMMY&=IN(DATA.PORT)
!
END
```

One more thing I just remembered. /RTS and /DTR are optional as far as the 8251 is concerned. /CTS (clear to send), however, MUST be low at the pin on the chip in order for the chip to transmit. That would translate to high on the EIA connector at pin 5. This term is handy to use as a busy signal for a printer. For instance, if your printer drops DTR when the buffer is full or it's out of paper, you can connect that terminal to CTS (pin 5 of the EIA connector) and the 8251 will stop transmitting. Jumpering RTS to CTS (4 & 5) will get it high by force and this is usually the way it's done for terminals.

That's all I can remember at the moment, so GOOD LUCK!

(Editor's note: Michael's programs are on MUG CP/M library disk 1911.)

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LETTERS

Lynn - Rd: Edition #55, February 1985. The problem at the bottom of page 8 with SPZ.COM sounds exactly like one I have with Structured Systems Group Payroll Ver. 2.0, which is in Z-80 machine code. This video display effect occurs whenever the software receives CTRL-A, the command intended to add records. The program is still functioning, but it appears to have lost track of the terminal definitions.

If you find a cure or a cause, please advise me.

Bob Potts, 112 First Street East, Independence, Iowa 60644.

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Buzz - This note is in regard to David Montgomery's letter in the January issue of the newsletter concerning the Dynabyte Naked Terminal. The problem with this card is it wants the address in a two-byte ascii form instead of a single-byte binary with an offset. The installation program printed in the newsletter didn't allow for this, although my CP/M version does. For example, the proper sequence sent to the terminal for line 5 column 15 would be:

```
ESC C 0 5 , 1 5 <CR>
1B 43 30 35 2C 31 35 OD
```

The example in the newsletter would send:

```
ESC C 5 , 15 <CR>
1B 43 05 2C 0F OD
```

The reason the BASIC line works is because BASIC automatically converts numbers to ascii characters unless you tell it not to with the CHR\$() function.

Also, the Naked Terminal doesn't support any video attributes. It doesn't even have a cursor right code, which causes problems with the edit\$ function.

Now I have a question. What ever happened to Robert Zale and System/z? I've been trying to get the 16-bit version of BASIC/Z (MS-DOS) for almost a year now and I've had no luck. I had even sent my money to DAMAN expecting shipment but Lynn finally sent my money back because System/z hadn't delivered and she couldn't get hold of Bob. Just think! With the MS-DOS version all your programs will run on the IBM PC and similar types (with modifications of course). In desperation I purchased a C compiler with my latest computer. It's when you try to use something else that you find out just how good BASIC/Z really is. Although the current version of BASIC/Z has some major shortcomings compared to C, the New version would have addressed most of these. And it sure would be easier to use! If you hear anything about it, let me know.

Michael Raney, Rt. 4 Box 115, Greenfield IN

MICROPOLIS/VECTOR GRAPHIC USERS GROUP NEWSLETTER #59 - JUNE 1985

Michael - Bob, and his MS-DOS version of BASIC/Z, remain a mystery to me. I have tried to talk to him by leaving messages on his answering machine, but to no avail. Lynn talks to a lady named Vivian, on occasion, who works for Bob. The story seems to be that Bob was developing a version of BASIC/Z for some west-coast computer manufacturer, and stopped development on the generic MS-DOS version. I have no idea who the manufacturer is, or whether the requirement was for CP/M or MS-DOS.

Supposidly, Bob is now back to the MS-DOS BASIC/Z development, but prefers to remain isolated from the world. Well, perhaps not the world. Lynn talks to people who talk to Bob. He just doesn't talk to us. At the moment I have no idea of what Bob's development schedule. I'll continue working on the problem. I'd surely like to see the MS-DOS version of BASIC/Z myself. The lack of it is the main reason I haven't purchased a 16-bit computer yet. Come to think of it, maybe Bob's doing me a favor. I don't really need a 16-bit computer anyway.

Never-the-less, if one leaves a specific question on Bob's answering service, it evidently gets to him and gets answered by Vivian. Not always right away, but it gets answered.

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CLASSIFIED

I have assumed, probably incorrectly, that all of you know that the classified section of the newsletter is free to all users. Just call or write us with a description of what you want to obtain, or dispose of.

WANTED: 1053 disk drives, subsystem. Call evenings after 8:00 PM Central. John Schlorholtz, Rt. 1, Box 38A, Percival, IA 51648. (712) 529-4301.

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FOR SALE: QUME S3/55 printer. \$400. Herman Kratz, 73-09 Myrtle Ave, Glendale NY 11384. (718) 497-6617.

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FOR SALE: Vector 3 computer. Dual double-sided disk drives. T.I. Omni 800 printer. \$2000. Mike Clerkin, 1923 s. Santa Fe, Los Angeles CA 90021. (213) 489-5150.

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FOR SALE: SOL 20 with 48K memory, Micropolis 1053 Dual MOD II drives, CP/M, software, documentation, cables, etc. Good working condition. \$750 plus postage. John Gorman Sr., 210 Sprague Ave. So. Plainfield NJ 07080. (201) 757-1361.

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MICROPOLIS/VECTOR GRAPHIC USERS GROUP NEWSLETTER #59 - JUNE 1985

CLASSIFIED (continued)

FOR SALE: Micropolis 1053 dual MOD II subsystem, \$400. Two Micropolis 1023 MOD II single drives, \$150 each. All drives modified to turn off when not accessed. Micropolis S-100 controller board, CP/M 2.2, MDOS 4.0, disk manuals, seven boxes disks with four boxes filled with software. Make offer (\$75). Mark Hanslip, (513) 268-7225, after 5:30 EDT.

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* MICROPOLIS/VECTOR GRAPHIC USERS GROUP NEWSLETTER *
* Published Monthly by DAMAN, 604 Springwood Circle, Huntsville AL 35803 *
* Subscription rates: North America; \$18/year Elsewhere; \$25/year, Airmailed *
* *
* For Assistance with general information, MUG/Vector Graphic, DAMAN hardware *
* & software, Micropolis Basic, Basic/z, Micropolis drives & Micropolis parts-*
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* Call Lynn or Buzz at (205)881-1697 during the Central Times of 9 AM to 9 PM.*
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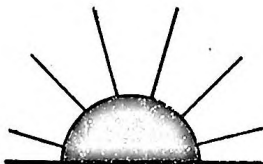
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ST CLASS MAIL

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Sunrise Data Systems

May 28, 1985

Dear Fellow User Group Members,

I have recently purchased the entire inventory of Vector Graphic products from a former Vector dealer. The items listed below are priced far below normal retail prices and offered as a "one time only" opportunity and will be sold on a "first-come first-serve" basis. Payment in full is required before these items will be shipped. Personal checks are OK for amounts not exceeding \$100.00 with Cashier's checks required on larger amounts.

All hardware carries a 30 day parts and labor warranty. The only warranty on software is that the diskettes are "readable" and the software is the same as was described on this advertisement. (We will make a copy of the original diskette and retain it for 30 days after purchase.)

The price listed on all items includes shipping via UPS except the computer and printer which include shipping via air freight to your closest commercial airport.

Don't hesitate to call if you have questions or would like to have some literature on any of these products. Any of these items may be inspected by appointment at our office in Nevada, Missouri or Shawnee Mission, Kansas:

1. 1 each - Vector Graphic Model 4/30 Computer - System has a 5 megabyte hard disk, a 5 1/4 inch double sided, hard sectored Tandon floppy drive (capable of reading and writing single sided diskettes from "System B's" or "MZ's"), and 128 kilobytes of RAM. Operating systems supported are "CP/M-80" (included), "CP/M-86" (included), and "MS-DOS" (optional). System looks virtually new (was a demo system) - call for more information. Regular retail price: \$4995.00 - Sale price: \$2950.00
2. 1 each - Vector Graphic Model 3500 Printer (alias: NEC Spinwriter) - True letter quality printer. Print speed of 35 characters per second. Includes bi-directional forms tractors. Printer looks virtually new (was a demo system). Regular retail price: \$2300.00 - Sale price: \$1250.00
3. Combination of items 1 and 2 above - If both items are purchased as a "system", I will include the most current release of Memorite III at no additional charge. Regular retail price: \$7790.00 - Sale price: \$4200.00
4. 1 each - BIS-3780 Hardware and Software - Provides the Vector Graphic Model 4 series with the ability to emulate an IBM Model 3780 terminal. Regular retail price: \$945.00 - Sale price: \$250.00